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(58) Field of search
F2E
B5A

(54) Friction pad and its manufacture

(57) In a friction pad 1 for use in a disc brake, the density of a friction material of the friction pad is varied in the rotational direction of a disc to produce high and low density zonea 2*a*, 2*b* to reduce brake squeal there may be three or more different density zones. As shown, the zones 2*a*, 2*b* are arranged in striped pattern in plan view, in Fig. 3 they make a chequer pattern.

To manufacture the pad, friction material (asbestos fibres, duct, copper powders and binding agents) are mixed and preformed to a wave-like cross-section with varying thickness—in a heating and compression moulding process the material is deformed into a flat form whereby the projected portions make high density zones and the recessed portions make low density zones.

Fig. 1

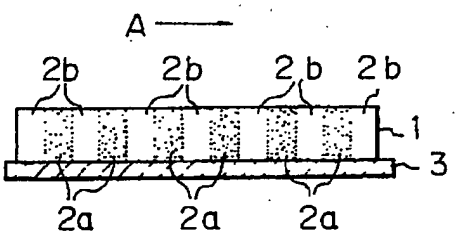

Fig. 5

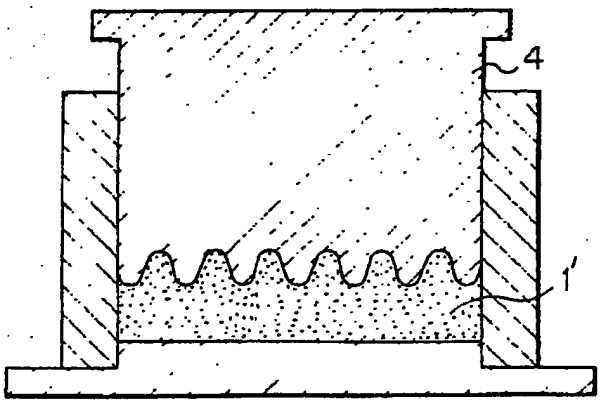

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Fig. 1

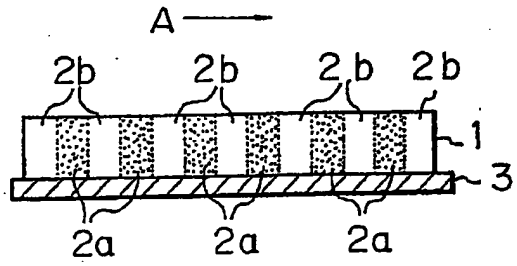


Fig. 2

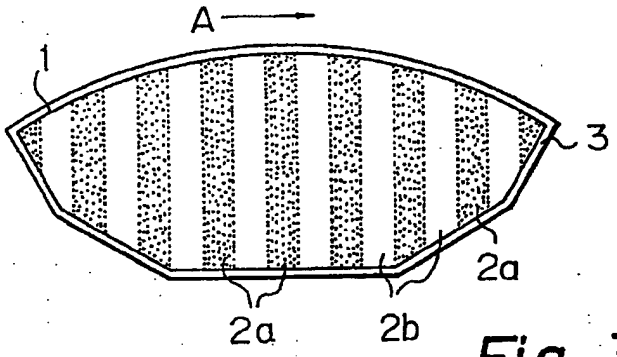


Fig. 3

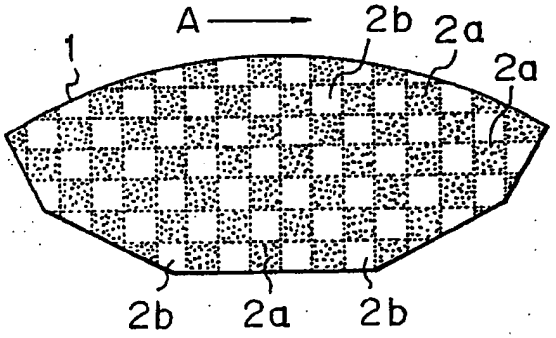


Fig. 4

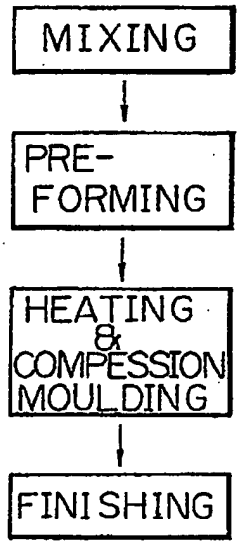
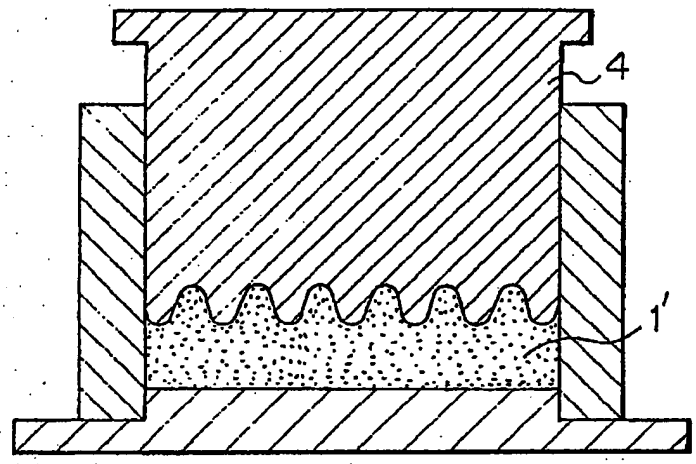

MIXING
PRE-FORMING
HEATING & COMPESSION MOULDING
FINISHING

Fig. 5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1'

SPECIFICATION

Friction pad and its manufacture

This invention relates to a friction pad for use in a disc brake, and particularly to a technique for suppressing the so-called squeal phenomenon in a disc brake. The invention also relates to the manufacture of such a friction pad.

The squeal phenomenon upon applying a disc brake is frequently observed as high pitched harsh sounds being generated and there are strong demands to suppress such phenomenon. The squeal phenomenon is based on frictional vibrations in a frictional sliding surface of the friction pad of the disc brake which slidingly contacts a rotating disc to apply the disc brake and the vibrations induce resonance vibrations in relating members. However, since the vibration system is complicated, it is very difficult to suppress completely such phenomenon and various proposals have been made with respect to respective parts including the friction pad.

Generally, the friction material of the friction pad is required to be superior as to the frictional force generated and as to the antiwear quality; however, these characteristics are contradictory to the squeal phenomenon. Namely, when the frictional force of the friction pad is improved, the squeal phenomenon is aggravated and the countermeasure for suppressing the squeal phenomenon sometimes decreases the frictional force of the friction pad.

This invention aims to provide a novel friction pad for suppressing the squeal phenomenon.

According to the invention, the density of a friction material of a friction pad for use in a disc brake is varied in the rotational direction of the disc.

Thus, the distribution of the surface pressure on the friction pad in applying the friction pad against the disc is varied in the rotational direction of the disc and, as a result, the vibration characteristics of the friction pad in the rotational direction of the disc are changed substantially, whereby it is possible to suppress the resonance vibrations. Further, the compressibility of the friction material can also be changed in the rotational direction of the disc, whereby the decrease in the frictional force and the antiwear characteristics can be minimized.

Preferably, high density zones and low density zones of the friction material are arranged alt rnately in th rotational directi n of the disc to define such as a striped r a ch quer pattern as viewed in a plan view.

The invention includes a method of making a friction pad for a disc brake, in which a lining mixture is preformed to produce a preform having a thickness which varies in the rotational direction of th disc and the preform is subsequently compressed into a flat form having high density and low density zones alternately in the rotational direction.

The invention will be further described by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a sectional view of a friction pad according to the invention;

Figure 2 is a plan view of the friction pad of Fig. 1;

Figure 3 is a plan view of a modified friction material;

Figure 4 is a flow chart of a manufacturing process of the friction pad, and

Figure 5 is a sectional view illustrating a preforming process.

In Figs. 1 and 2, the friction pad according to the invention comprises a friction material 1 secured to a backing plate 3 by conventional technique. The friction material 1 comprises high density zones 2a and low density zones 2b which are arranged alternately as viewed in rotational direction A of a disc (not shown in the drawings) and, as clearly shown in Fig. 2, the zones 2a and 2b make a striped pattern. In a modified embodiment of Fig. 3, the high density zones 2a and low density zones 2b make a chequer pattern.

Although the embodiments show only two patterns, wherein high and low density zones are arranged regularly and alternately, the invention is not limited to specified embodiments; namely, three or more different density zones may be arranged at desired intervals to define a desired pattern.

A preferred manufacturing process for the friction pad of Fig. 1 will now be explained with reference to Figs. 4 and 5. A friction material of a disc brake is usually manufactured by the process shown in Fig. 4. Namely, the friction material is usually composed of friction and anti-wear adjusting agents, such as asbestos fibres, dust, copper powders and the like, and binding agents, such as phenolic resin or the like, which are mixed together by utilizing, for example, a V type mixing machine during a mixing process. The mixture is processed in a preforming process wherein a predetermined amount of the mixture is moulded to have the configuration of the friction material at ambient temperature. In the heating and compression moulding process, a high temperature and a high pressure are applied to obtain desired characteristics.

Preferably, the friction material according to the invention is preformed in the preforming process to produce a preform having a wave-lik cross-secti n, as shown in Fig. 5 such that the thickness thereof varies in th rotational direction of the disc and, in the heating and compression moulding pr cess the friction material is forcibly deform d into a flat form, whereby the projected portions make high density zones and recessed portions make low density zones. Shown at 4 in Fig. 5

is a m tal mould and at 1′ is the mixtur being preformed.

As heretofore described, the friction pad according to the invention can effectively suppress the squeal phenomenon with satisfying required characteristics as a friction pad.

CLAIMS

1. A friction pad for use in a disc brake wherein the density of a friction material of the friction pad is varied in the rotational direction of a disc.

2. A friction pad according to claim 1, wherein high density zones and low density zones of the friction material are arranged alternately in the rotational direction of the disc.

3. A friction pad according to claim 2, wherein high density zones and low density zones are arranged in a chequer pattern, as viewed in a plan view.

4. A friction pad according to claim 2, wherein high density zones and low density zones of the friction material are arranged in a striped pattern, as viewed in a plan view.

5. A method of making a friction pad for a disc brake, in which a lining mixture is preformed to produce a preform having a thickness which varies in the rotational direction of the disc and the preform is subsequently compressed into a flat form having high density and low density zones alternately in the rotational direction.

6. A friction pad constructed substantially as herein described with reference to and as illustrated in Figs. 1 and 2 or Fig. 3 of the accompanying drawings.

7. A method of making a friction pad substantially as herein described with reference to Figs. 4 and 5 of the accompanying drawings.

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